Burroughs Instruction Book

Class 2 Machines

Book No. 205

INTRODUCTION

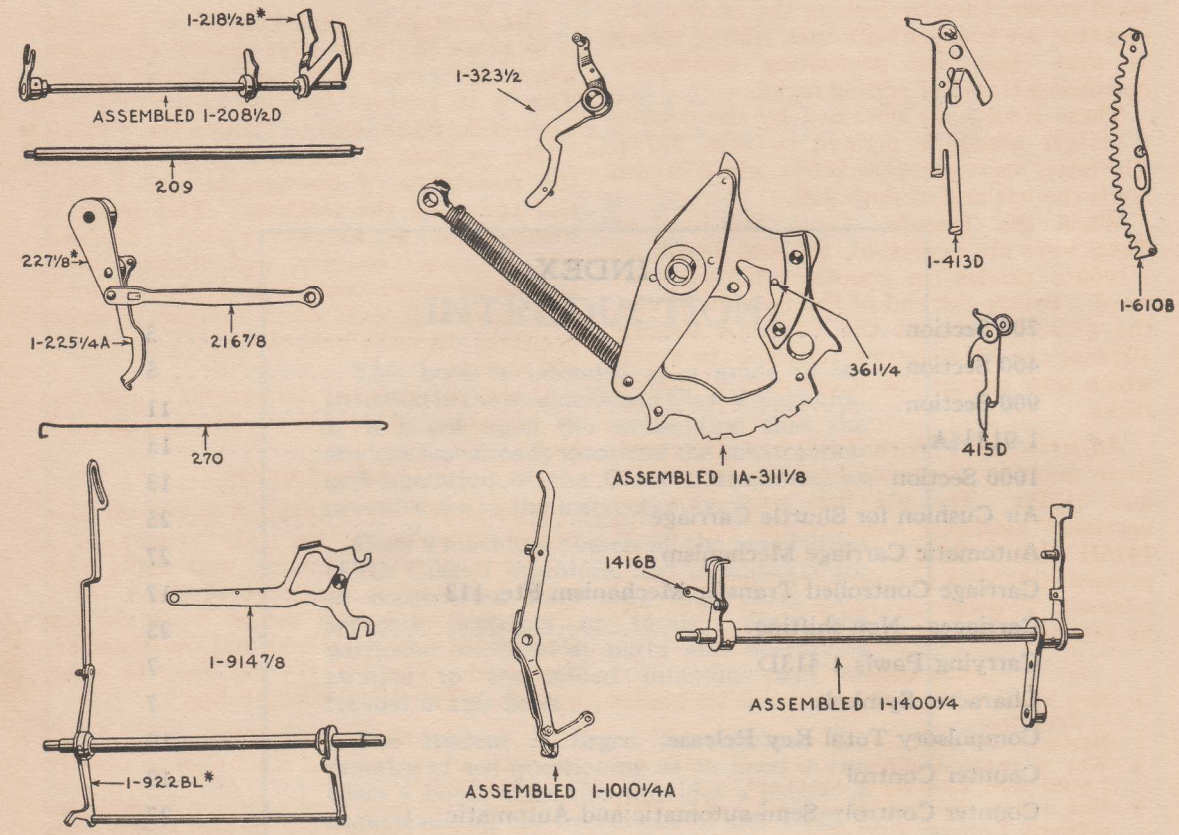
This book is intended as a guide to instruction in the mechanism of Class 2 machines. It is based upon the assumption that the student has already mastered the construction and operation of the Class 1 machines, as provided for in the instruction book.

Class 2 machines possess all the possibilities of the Class 1 machines, and in addition are so constructed that they may carry two separate accounts or totals. Only the particular mechanical parts and operations relative to the added functions will be treated in this book.

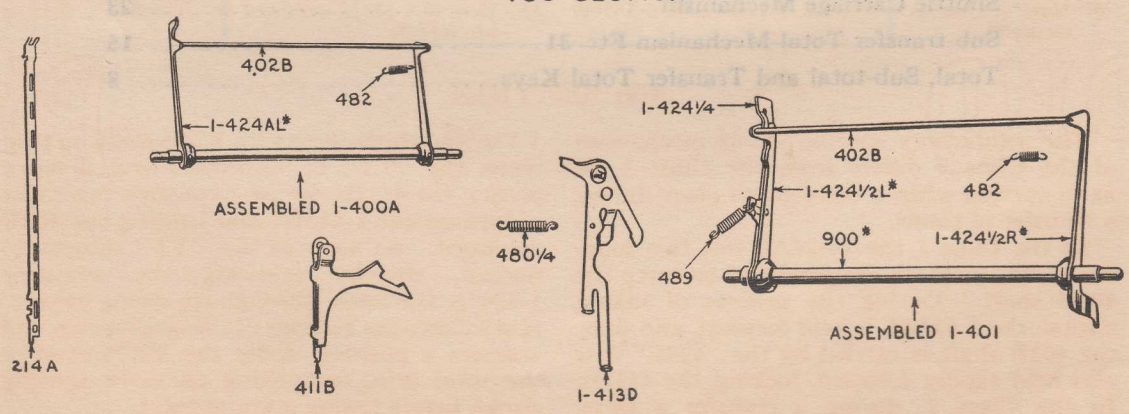
The student is urged to continue the practice of self-questioning as outlined in the Class 1 book, since this provides a means of understanding the operations of the Class 2 machine more fully and quickly.

INDEX

200 SECTION



400 SECTION



200 SECTION

Printing a clear signal when the counters are clear, or in printing a total where only a part of the sectors are used, the 209 shaft, which raises the 415D, is released before the end of the forward stroke, thereby locking the adding sectors that are engaged with such adding wheels as were clear and preventing unncessary downward travel of adding racks.

These results are obtained by the coupler 1-225¼A which is pivoted to arm 227⅛. The latter also carries the 216⅞, which in turn holds the left end of shaft 209.

When the Transfer Total, Sub-total or Total keys are depressed, the arm 1416B on 1-1400¼ carries the coupler 1-225¼A rearward. Before the end of the forward stroke, the 1-922BL releases the 1-225¼A thereby allowing the 209 to return, releasing the 415Ds which now engage the upper step of adding racks.

Adjustment. With Total key depressed, there must be clearance between the 415Ds and 610Bs. Try the first one. To get necessary clearance advance the contact of 1416B with 1-225¼A. With Total key depressed, 1-225¼A to clear 1416B before 120 is released. To secure clearance adjust 1-225¼A, by bending down or slightly twisting.

SELF-QUESTIONS

1—How is arm 227⅛ which moves shaft 209 coupled to Total key?
2—How is the 209 shaft released?
3—Why is clearance necessary between 415D and 1-610B when Total key is depressed?
4—How is more clearance between 415D and 1-610B obtained, Total key depressed?
5—Why should 1-225¼A clear 1416B with Total key depressed before 120 is released?
6—How is clearance between 1-225¼A and 1416B secured?
7—Why should 1-225¼A have full hold on 1416B?
8—What adjustment is necessary for full hold of 1416B on 1-225¼A?

1-218½B

The function of the 1-218½B on 1-208½D is to block the total keys against depression when shift lever has been partly moved. This is to prevent bending of 1-710¾ and connecting parts; also to actuate the 1-323½.

The purpose of the 1-323½ is to prevent the possibility of disengaging the 1-914⅞ and operating the machine. This could be manipulated as follows: 1-323½ disabled, add 99 upper counter, and transfer total, add 88 in upper counter and transfer total, now move shift lever about half way to center position. Observe hold of 1-914⅞ on stud in 900 section.

It also prevents the disengaging of counters at beginning of return stroke, and possible lock.

Adjustments

With shift lever 1-1010¼A in central position of guide slot, see that 1-323½ clears 361¼.

Clearance of the 1-323½ and 361¼ is secured by stoning the ledge of the 1-323½. The operating handle should be in the last stop on the forward stroke and the Total key depressed. The 1-323½ can then be easily stoned. (Test 119 for length first.)

SELF-QUESTIONS

9—What are the functions of 1-218½B on 1-208½D and 1-323½?
10—What would result if the 1-323½ was removed and the machine operated with the shift lever in center of slot and one or more 1-413Ds in a tripped position, lower counter active?
11—How is 1-323½ adjusted to clear 361¼ stud in 1A-311⅛?

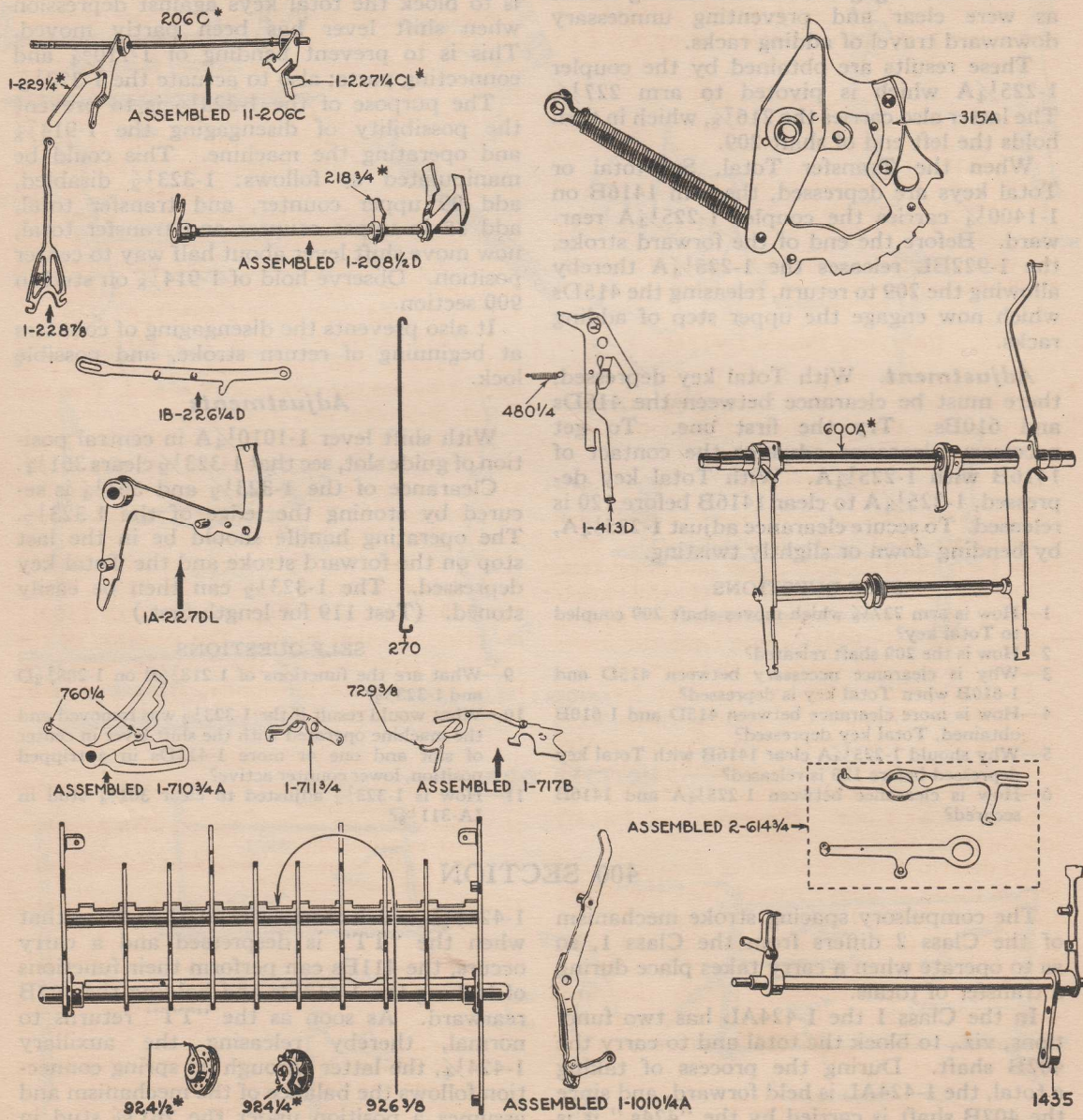
400 SECTION

The compulsory spacing stroke mechanism of the Class 2 differs from the Class 1, so as to operate when a carry takes place during a transfer of totals.

In the Class 1 the 1-424AL has two functions, viz., to block the total and to carry the 402B shaft. During the process of taking a total, the 1-424AL is held forward, and since the 402B shaft is carried by the "424s," it is also held rigidly forward, locking the 411Bs. In the Class 2, during a transfer a carry usually takes place, and for that reason, the shaft 402B must permit the 411Bs to lock the 1-413Ds, therefore, an auxiliary 1-424¼ is used, which swings freely on the 900 shaft. Its function is to lock the total after a carry takes place. It is spring connected to the 1-424½L which carries the 402B shaft, so that when the "TT" is despressed and a carry occurs, the 411Bs can perform their functions of locking the 1-413Ds and holding the 402B rearward. As soon as the "TT" returns to normal, thereby releasing the auxiliary 1-424¼, the latter through its spring connection follows the balance of the mechanism and assumes a position under the 261⅛ stud in the total arm, compelling an extra spacing stroke before taking a grand total.

In the Class 1 the holding of the entire 1-401 in a rearward position is obtained by the 214As which, when a key is depressed, relieves the 411Bs of the tension of the 482 spring. In the Class 2, this is accomplished by a lower extension of the 1-424½R.

CARRYING PAWLS AND CHARACTER SYMBOLS



Note: Class 2 machines equipped with item counters or semi-automatic keyboard counters have the lower extension of 1-424½R removed, to prevent a count taking place during a "TT" key operation. In order to secure a positive carry during a "TT" operation, spring 482 must have lighter tension or 480¼ springs having slightly heavier tension should be used on carry pawls 1-413D. A single carry in each column during a "TT" operation should be tested.

SELF-QUESTIONS

12—Why is the compulsory spacing stroke mechanism of the Class 2 machine different than that of the Class 1?
13—What are the functions of the 1-424AL in Class 1?
14—What is the function of 1-424¼?
15—Why is 1-424¼ connected to 1-424½L by spring 489?
16—What is the purpose of lower extension of 1-424½R.

For illustrations described in the above description, refer to previous page No. 4

Carrying Pawls 1-413D

The carrying pawls 1-413D, in Class 2 machines, have an extra lower foot, which is necessary for the operation of the lower adding section.

Adjustments

The same tests as those used in the Class 1 machines hold true; however, those tests must be applied to both upper and lower feet.

During a transfer operation the lower counter is drawn in mesh with the adding racks. The cam 924½ must clear the lower foot of the 1-413D as the mesh takes place.

It is therefore necessary to test for this clearance as though the adding racks were limiting on a 270 limit. With lower counter clear, transfer total key depressed and handle forward, unhook 480¼ springs and rock lower counter in and out. Movement of 1-413D indicates no clearance.

To determine the amount of clearance, the test is made as above except that the 480¼ springs are hooked up and the upper section is rocked in and out of mesh with the 610s. The amount of movement of the 610s indicates the amount of clearance; excess clearance would result in the failure of the 415s engaging the upper step of the 610s when totaling lower counter.

SELF-QUESTIONS

17—Why is an extra foot on carrying pawl 1-413D necessary?
18—What tests are observed in adjusting 1-413D?
19—How is clearance of lower cam 924½ over foot of 1-413D observed?

Character Symbols

The Class 1 machines automatically print symbol characters to identify Non-add, Sub-total, and Total, from items which are not marked. The Class 2 prints additional symbols, Transfer Total and lower counter items, and distinguishes the regular symbols when in the upper counter, by a dash above and when in the lower counter, by a dash below, the characters.

These results are obtained by locating the character type in printing position, through the index arm, 1-710¾A. The latter has two sets of steps acting as stops for the type sector. The front steps are used for the upper and the rear steps for the lower counter. The 1-710¾A is operated by the section 11-206C.

The steps of the index arm 1-710¾A are brought into position by engagement of the forks of 1-228⅞. The upper fork when the shift lever is in upper position and the lower, when in lower position. This movement is accomplished by 2-614¾ and 218¾ of 1-208½D and shift lever 1-1010¼A.

1-228⅞ is connected with 1-227¼CL, by link 1-229¼, and shaft 206C. 1-227¼CL is moved by the operation of Non-add, Transfer Total, Sub-total and Total keys.

The lowest step of 710¾ locates the lower counter symbol. The printing and non-printing of the lower counter symbol is controlled as follows: The 1310¼ of the 1-717BR moves forward on each listing stroke. When the 729⅜ of the 1-717B is engaged with 1310¼ it is drawn forward raising the 717. When the 729⅜ is out of engagement with 1310¼ no printing takes place. The position of the 729⅜ is governed by the 1-711¾, which in turn receives its movement from the shift lever through the 2-614¾.

SELF-QUESTIONS

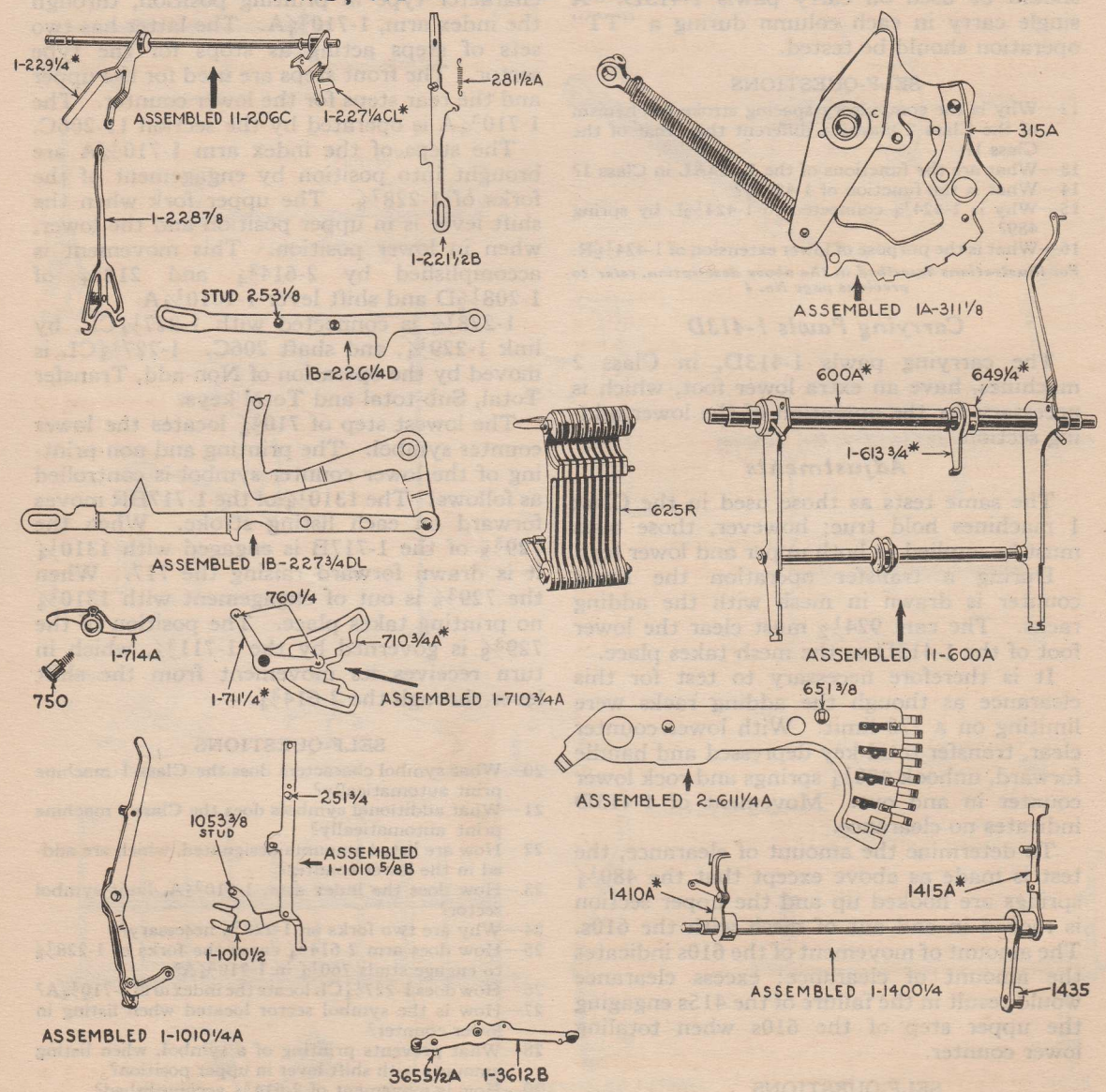
20—What symbol characters does the Class 1 machine print automatically?
21—What additional symbols does the Class 2 machine print automatically?
22—How are listed amounts designated, which are added in the lower counter?
23—How does the index arm, 1-710¾A, limit symbol sector?
24—Why are two forks on 1-228⅞ necessary?
25—How does arm 2-614¾ cause the forks of 1-228⅞ to engage studs 760¼ in 1-710¾A?
26—How does 1-227¼CL locate the index arm 1-710¾A?
27—How is the symbol sector located when listing in lower counter?
28—What prevents printing of a symbol, when listing amounts with shift lever in upper position?
29—How is movement of 2-614¾ accomplished?

Adjustments

To insure accurate indexing of character symbols at all times, a series of tests and adjustments are given covering the 1-710¾A, and its connecting parts. It is important that the inspector acquire this knowledge.

The basic limit for the Total, Sub-total

TOTAL, SUB TOTAL AND TRANSFER TOTAL KEYS



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Pages 9-24 missing

115—When Carriage Normal key (3420) is released, what blocks the downward movement of outer feed slide (1A-3410¼)?
116—Why does inner feed slide (1-3410½) have just one set of jaws?
117—When Carriage Normal key is released, why does the machine space up on each alternate stroke?

Adjustments

With the carriage in Non-add position, arm 1-3424½ should not have any lost motion in slot of Keyboard Flash (1-10223). Roll (3433¼ on 1-3420¾) must clear the highest point of cam 1-3418½. This adjustment can be accomplished by bending arm 3420¼.

When arm 1-3420¾ is in add position, or is on the highest point of cam 1-3418½, there should be clearance between stud 3450⅛ (on 1-3429⅛A) and 1-3420⅛.

Inspect 1-3426¾ R & L for lost motion when engaging stops 1-2893A # 8.

With the carriage in right-hand position, handle forward and carriage out of printing position, the feed bail (1-2806¼) and outer feed slide 1A-3410¼ must be perfectly free.

When the carriage is in right-hand position and Carriage Normal key (3420) is depressed, coupler 3414A must limit on screw (3455⅜) in back plate. Feed arm (1-3427) should have slight play at each end of stroke, with carriage in both positions.

When coupler (3414A) is held back by slide (1-3426A) and bail (1-2806¼) is resting on the fingers of inner feed slide (3410½). Coupler (3414A) should clear top of 3457¼ stud by $\frac{1}{32}$" and must be back far enough over 3457¼ stud, to prevent bail (1-2806¼) from following down, when handle is pulled.

Also when bail (1-2806¼) is resting on bail stop (2824⅝), and the Carriage Normal key is depressed, or the Shuttle Carriage mechanism is operated, causing coupler 3414A to engage with lower foot of inner feed slide 3410½; the coupler 3414A should have $\frac{1}{32}$" clearance under foot of inner feed slide 3410½ and should limit on screw 3455⅜.

In accomplishing this, raise or lower bail stop (2824⅝). It may sometimes be necessary to bend lower jaw of inner feed slide (3410½) either up or down.

SELF-QUESTIONS

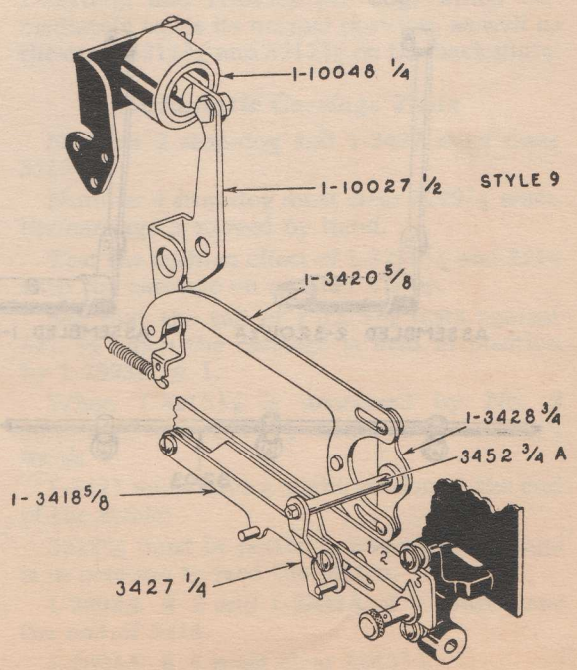
118—Why is the full tooth gear (1-3431¾A) necessary in shuttle carriage machines?
119—When the Carriage Normal key (3420) is depressed what disables the shuttle mechanism?
120—How is the movement transmitted from 2A-3400½ section to carriage?
121—Why are 1-3426¾R & L held together with spring 1-3484½?
122—Why is it necessary to change shuttle bar 1A-3418 and 3429½ when the throw of carriage is changed?
123—What controls the movement of Keyboard Flash (1-10223)?
124—What is the function of cam 1-3418½?
125—With the roll 3433¼ (on 1-3420¾) in Non-add position, on cam 1-3418½, what would be the effect on the position of the Non-add signal (1-10223) if arm 3420¼ was shortened by bending?
126—What is the limit for coupler (3414A) when the Carriage Normal key (3420) is depressed and carriage is in right-hand position?
127—Why is cam 1-3418½ adjustable to three positions?
128—Why should 3414A limit on 3455⅜ with Carriage Normal key depressed?
129—What is the purpose of 3457¼ stud?

Air Cushion for Shuttle Carriage

When the carriage is shuttling, one of the studs in bar 1-3418⅝ rocks arm 3427¼ on the rear end of shaft 3452¾A. Arm 1-3428¾ on the front end of shaft 3452¾A carries two studs which alternately contact in the ends of the slots of part 1-3420⅝. The movement of part 1-3420⅝ rocks lever 1-10027½ which operates the plunger in dash pot 1-10048¼. A small hole in the bottom of the dashpot allows the air to escape slowly which absorbs the shock of the carriage coming to a stop. The air outlet is governed by a screw in front of the hole. The air resistance is increased or decreased by turning the screw toward or from the hole. All parts must move freely.

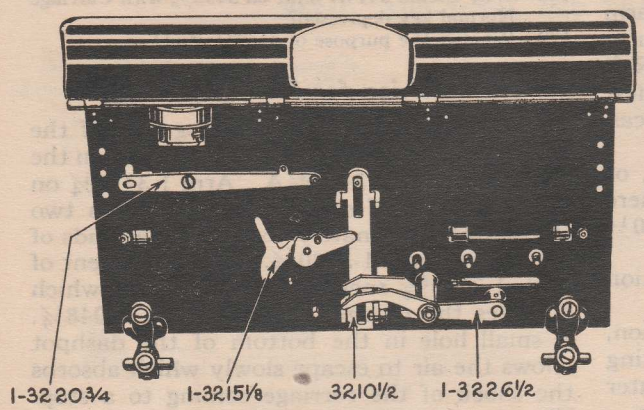
SELF-QUESTIONS

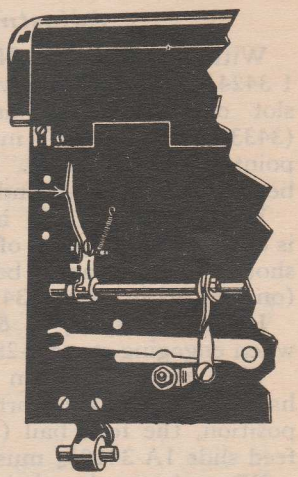
130—Describe how the shuttling of the carriage actuates the air cushion mechanism.
131—How is the resistance of the air cushion controlled?

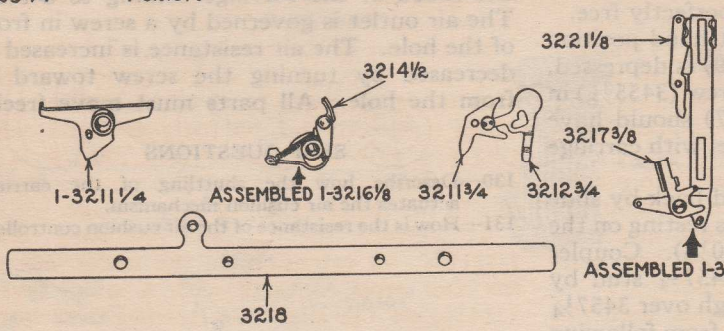


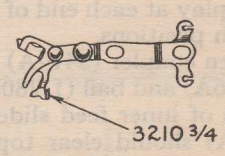
AUTOMATIC COUNTER CONTROL

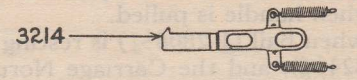
AND AUTOMATIC CARRIAGE MECHANISM

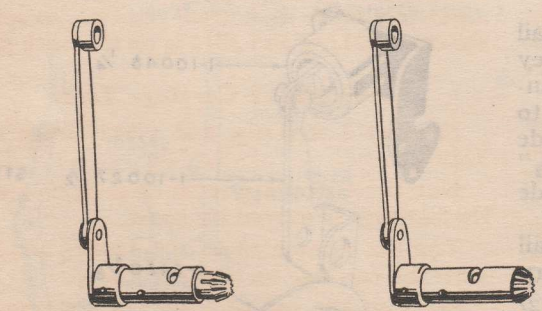


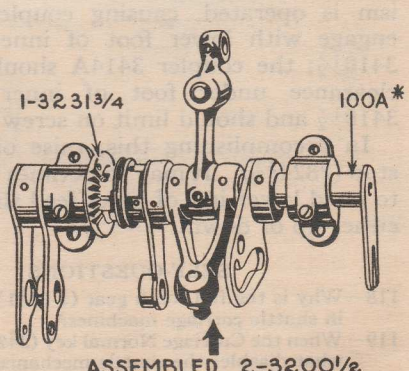


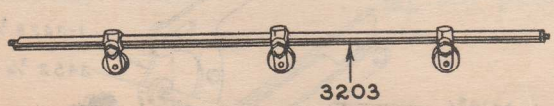












Automatic Counter Control Mechanism

In this type of machine the counters shift alternately with each stroke of the handle, provided that both control keys are raised, just as is the case with shuttle carriage machine. The mechanism is practically identical. To prevent the counters shifting when cross tabulating, except as desired, a series of rolls is used carried by the auxiliary bar 3203. These rolls depress cam lever 1-3226½ which in turn depresses disengaging arm 1-3216½. This acts in exactly the same manner as the depression of the Counters key, described on Page 20.

Automatic Carriage Mechanism

The Automatic Carriage as its name indicates, returns of its own accord to the first printing position. Mechanically it is a combination of the shuttle and semi-automatic carriages. In normal operation, the two feed-slides are connected by means of coupler 3221⅛, which is thrown in and out of engagement by the disabling arm 1-3220¾, attached to the Normal key. In this position, the carriage is stationary, and the platen feeds with each stroke of the handle.

Consider that the carriage has been placed on the first stop, ready for cross-tabulating; the Normal key has been released, and thus disconnected the two feed slides and connected the clutch on the drive shaft.

The inner slide, only, descends with the forward stroke of the handle, while the over-throw stop 3210¾, forming the left-hand edge of the stop block, drops down to release the stop-dog and to afford free travel for the carriage.

With the same forward stroke, slide bar 3218 is carried to the left by the semi-circular movement of the crank, and operating dog 1-3211¼ engages with the second stop. The return of the handle results in the carriage being thrust over to the left a distance equal to the throw of the crank, if the stops have been set up correspondingly.

The same operations are repeated until the stop next to the last, on the right-hand end of the carriage, is reached. The first or left-hand stop is style 4; intermediate stops are style 2; the next to the last is style 1; the right-hand stop is style 3. Stop No. 1 is the same length as the others, but is ground away on the under side.

Thus, when the carriage comes to rest on this stop, cam 1-3215⅛ is permitted to rise a trifle higher than with the other stops. (Note that the cam just referred to forms the right-hand edge of the stop block of which 3210¾ forms the left.) With the increased travel of the cam, latch 3217⅜ attached to the outer feed-slide is permitted to move far enough to the left to engage with a wing on inner feed-slide 3210½. In this manner, the two feed-slides are coupled and made to operate together with the next stroke of the handle so that the platen is turned one notch after the printing of the item.

Stop No. 1 determines the ***last*** printing position. At the same time that the handle is describing its forward stroke to print the last item, operating dog 1-3211¼ contacts with a beveled extension on the under side of the last stop-dog, No. 3; the dog tips down and is latched in that position so that it cannot engage with any stop on the return stroke. Instead, a wing on its right-hand end engages with a cam, 3211¾, on the back plate, swings it over, depresses the point of the right-hand block, 1-3215⅛, and permits the carriage to be drawn over to the right by means of the spring drum which the left-hand travel of the carriage had placed under tension.

Movement of the carriage beyond the first stop 4, is arrested by an elongation on this stop which engages block 3214, the end of which is directly behind the right-hand cam, 1-3215⅛, previously mentioned. Block 3214 also serves as a buffer to take up any shock due to the rapid return of the carriage.

To restore the tripped operating dog, 1-3211¼, an extension on the under side of the first stop contacts with a small lever, 3214½, on the slide bar; throws over latch 1-3216⅛; and releases the dog, which immediately takes its normal position, as well as the cams 3211¾ and 3212¾ on the back plate.

Automatic Carriage Tests

Number 2 stop-dog and 1-3427 must clear 3210¾.

Number 4 stop-dog must clear 3229¾ when the carriage is moved by hand.

Test the cushion effect of 1-3218½ and 3214 with the carriage on number 4 stop.

See that the tail of 1-3215⅛ rests against 3217⅜ when the carriage is held in position by 1-2893A # 1.

When 1-3215⅛ is depressed by No. 2 stop-dog, the 3217⅜ must clear 3210½ by $\frac{1}{32}$".

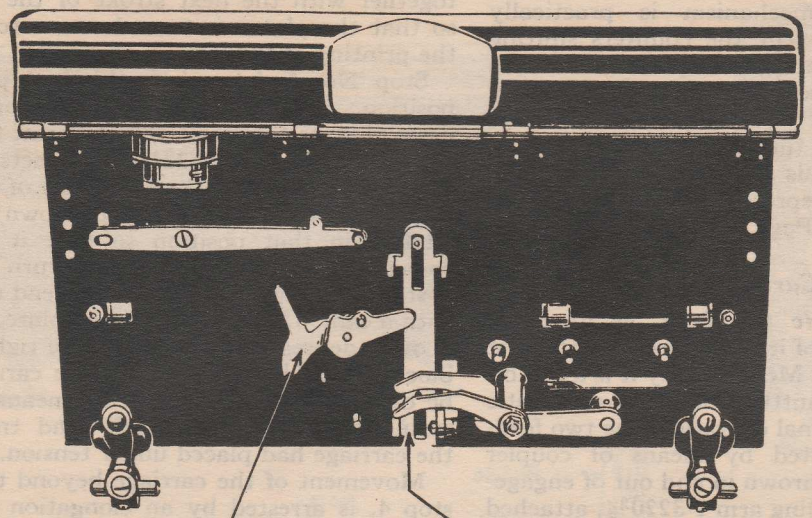
1-3427 must have a slight motion at the end of the stroke.

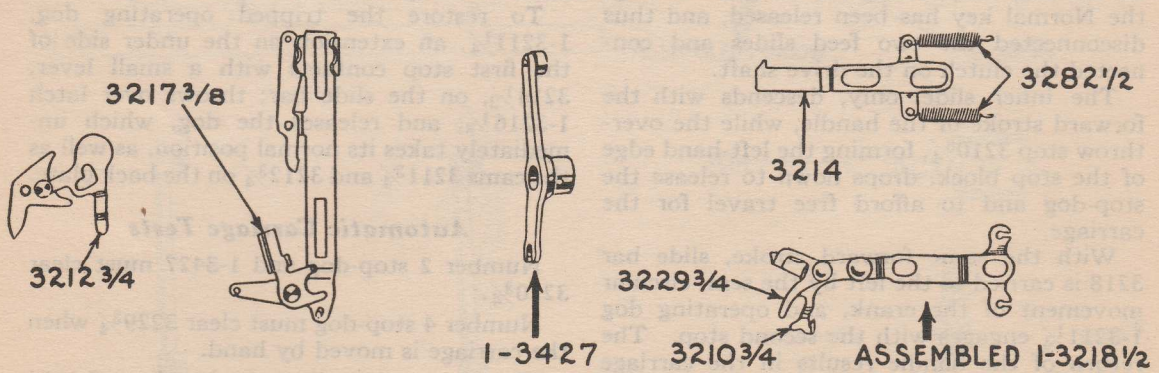
3212¾ must be perfectly free when carriage is in position to feed the platen.

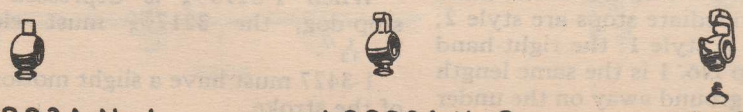
1-2893A # 2 and 1-2893A # 1 must clear the end of 3214.

1-2893A # 4 must clear 3282½.

AUTOMATIC CARRIAGE MECHANISM (CONTINUED)







SELF-QUESTIONS

132—Why is the spring barrel placed on the opposite side of the machine on an automatic as compared to a semi-automatic?

133—When does the platen feed with each stroke of the machine?

134—What couples the 1-3210¼ and 3210½ when the Normal key is depressed?

135—How does the clutch couple the 1-3231¾ and drive shaft (100A of 2-3200½)?

136—Why is the 1-3231¾ not a full-tooth gear?

137—How does the movement of the 2-3201½A differ from the movement of the 1-3401½ on the shuttle carriage machine?

138—What limits the distance between stops on an automatic stop bar?

139—Why does the No. 1 stop permit the 1-3215⅛ to raise higher than the No. 2 or 4 stops?

140—When the Normal key is depressed does the same latch connect the feed slides 1-3210¼ and 3210½ as in automatic tabulation when No. 1 stop is in position on the 1-3215⅛?

141—Why is a No. 3 stop dog used on an automatic carriage machine?

142—When the operating dog 1-3211¼ is locked down by the 1-3216⅛ what releases it when it reaches the end of the carriage movement?

143—What returns the carriage to the right of the machine?

144—Why are more than one No. 2 stops used and only one each of the Nos. 1, 3, and 4 on an automatic stop bar set-up?

145—Why do the Nos. 4, 1 and 3 stops together give the carriage the same action as a shuttle carriage machine?

146—Why are the 3214 and the 1-3218½ connected together with two springs (3282½)?

Produced by Burroughs, Detroit, Michigan

Form 3702-4M-5-28-Factory (G7896)